Transfer System User's Manual

Revision Date March 23, 2011

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Do not attempt to operate or maintain this panel(s) until you have read and thoroughly understand all of the safety information contained in this manual. All such information must be taken seriously. This panel contains high voltage which can cause serious injury or death. If you do not understand any part of this manual, seek assistance from your supervisor or call KSi Conveyors, Inc. before operating this equipment.
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Thank you for choosing KSi Conveyors, Inc. for your automation needs. We appreciate your business and will work diligently to ensure that you are satisfied with your choice.

Document Scope & Purpose

This document describes the logic and control functions provided by the control software. It includes sequence of operations for the PLC. It does not cover any equipment controlled by the panel. Safety and other necessary information should be included in the documentation for those specific components.

This manual is not intended to provide instruction on specific applications of the equipment nor on the safety practices common to your industry.

Owner Responsibilities

As the purchaser/owner/integrator of this equipment and control system, you have an obligation to design, install, operate and maintain the equipment in a manner that minimizes the exposure of people in your care to any potential hazards inherent in using this control system and associated equipment. This control panel(s) is a component of a process stream. It works together with other components to form a complete system. It cannot operate as a standalone component. Therefore it is critical that the owner of this equipment and control system:

- Has a clear and documented understanding of the process this panel is being used in, and of any resulting hazards or special requirements arising from this specific application.
- Allow only properly trained and instructed personnel to install, operate or service this equipment.
- Maintain a comprehensive safety program involving all who work with this panel(s) and other associated process equipment.
Establish clear areas of staff responsibility (e.g. operation, setup, sanitation, maintenance and repairs).

Perform an electrical hazard analysis to determine the Incident Energy Exposure to select the level of personal protection equipment and to determine the Flash Boundary. Refer to NFPA 70E for further information.

Provide all personnel with the necessary safety equipment.

Periodically inspect the equipment to insure that the doors, covers, guards and safety devices are in place and functioning, that all safety instructions and warning labels are intact and legible and that the equipment is in good working order.

In addition to the operating instructions, observe and enforce all applicable legal and other binding regulations, national and local codes.

Install the panel(s) in the process stream in accordance with the guidelines outlined in the chapter titled “Installation”.
Operator Responsibilities

As the person with the most to gain or lose from working safely, it is important that you work responsibly and stay alert. By following a few simple rules, you can prevent an accident that could injure or kill you or a co-worker.

☐ Disconnect, lockout and tagout electrical and all other energy sources before inspecting, cleaning, servicing, repairing or performing any other activity that exposes you to an electrical hazard.

☐ Do not operate, clean or service this panel until you have read and understood the contents of this manual. If you do not understand the information in this manual, bring it to the attention of your supervisor or call KSi Conveyors, Inc. for assistance.

☐ Understand and follow the safety practices required by your employer and this manual.

☐ Do no attempt to perform electrical work if you are not an electrically qualified worker. Know you limitations and do not attempt to perform electrical work beyond what you are capable of doing safely.

☐ Wear the appropriate personal protection equipment and use the appropriate tools for the electrical work to be performed.

☐ PAY ATTENTION to what you and other personnel are doing and to how these activities may affect your safety.

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![Warning Symbol]

**WARNING**

Failure to follow these instructions may result in serious personal injury or death.
Receiving Your Equipment

As soon as the panel is received, it should be carefully inspected to make certain the unit sustained no damage during shipment and that all items listed on the packing list are accounted for. All damage or shortages should be noted on the Bill of Lading. The purchaser must take immediate steps to file reports and damage claims with the carrier. All damages incurred during transit are the responsibility of the common carrier if the equipment was shipped FOB. Ownership passes to purchaser when the unit is loaded and accepted by carrier. By law, any claims for in-transit damage or shortage must be brought against the carrier by the purchaser.

Handling and Storage of Your Equipment

If the panel is not going to be installed soon after arrival, it should be stored in a dry location to protect against rust and corrosion. The panel is shipped from the factory mounted in a heavy shipping crate to prevent foreign materials and moisture from contaminating the panel during shipping. It is recommended that the panel remain in the crate until just prior to installation. Transport the panel from the unloading site to the installation or storage site by using a forklift or hand-truck. The panel should be picked up by the crate, not by the panel itself.
2 - Safety Information

Alerts, symbols, warnings and cautions for safe operation of the equipment.

Every year, accidents in the work place injure, maim and kill people. Some of these accidents involve electrical shock or arc flash. Although it may be impossible to prevent all accidents, those involving electrocution are completely preventable with the right combination of training, operating practices, safety devices and operator vigilance. The purpose of this section is to help educate panel users about potential hazards, unsafe practices and recommend hazard avoidance techniques.

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**WARNING**

Do not attempt to operate or maintain this panel(s) until you have read and thoroughly understand all of the safety information contained in this manual. All such information must be taken seriously. This panel contains high voltage which can cause serious injury or death. If you do not understand any part of this manual, seek assistance from your supervisor or call KSi Conveyors, Inc. before operating this equipment.

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Signal Words and Symbols

It is very important that operators and maintenance personnel understand the words and symbols that are used to communicate safety information. Signal words, their meaning and format have been standardized for U.S. manufacturers and published by ANSI. The European Community (E.C.) has adopted a different format based on the International Standards Organization (I.S.O.) and applicable machinery directives. Both formats are presented below.
Graphic symbols are not standardized, but most manufacturers will use some variation of the ones seen in this manual.

**DANGER**
Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

**WARNING**
Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

**CAUTION**
Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury and/or property damage.

**SAFETY INSTRUCTIONS**
Provides additional information that the operator needs to be aware of to avoid a potentially hazardous situation.

**Mandatory Lockout Power Symbol.** Disconnect, lockout and tagout electrical and all other energy sources before inspecting, cleaning or performing maintenance on this panel.

**International Safety Alert Symbol.** The exclamation point (!) surrounded by a yellow triangle indicates that an injury hazard exists. However, it does not indicate the seriousness of the potential injury. An exclamation point (!) is used with the DANGER, WARNING and CAUTION warnings. When used in conjunction with these symbols the potential injury is indicated.

**Electrocution Hazard Symbol.** This symbol indicates that an electrocution hazard exists. Serious injury or death could result from contacting high voltage.

**Electrocution Hazard Symbol.** (ISO format) This symbol indicates that an electrocution hazard exists. Serious injury or death could result from contacting high voltage points.
**Mandatory Lockout Tagout Action Symbol** (I.S.O. format). This symbol instructs the operator to disconnect, lockout and tagout all electrical power and other energy sources before inspecting, servicing or cleaning a panel.

**Mandatory Read Manual Action Symbol** (I.S.O. format). This symbol instructs personnel to read the Operator Manual before servicing or operating this panel.

**Mandatory Read Manual Action Symbol**. This symbol instructs personnel to read the Operators Manual before servicing or operating this panel.

This symbol indicates that an important maintenance or installation detail is being described. Special notice should be taken to heed the instructions to prevent damage to the equipment.

This symbol indicates that there is an arc flash explosion danger. Arc flash explosions can release tremendous amounts of energy instantaneously. This can propel debris, vaporized metal and extremely hot gases at very high velocities. Serious injuries, burns or death could result from being in close proximity to or in the direct path of an arc flash explosion and the flying debris.
This symbol indicates that appropriate personal protection equipment and clothing are required before inspecting, servicing or cleaning the control panel. Employees must wear and be trained in the use of appropriate protective equipment for possible electrical hazards they may face. Examples of protective equipment could include a hard hat, face shield, flame resistant neck protection, ear protectors, Nomex™ suit, insulated rubber gloves with leather protectors, and insulated leather footwear. All protective equipment must meet the requirements as shown in the latest edition of NFPA 70E. Protective equipment, sufficient for protection against the potential electrical flash, is required for every part of the body. The selection of the required thermal rated PPE depends on the incident energy level at the point of work.

This symbol indicates that only qualified personnel should inspect or service this panel and the connected electrical components. A qualified worker is someone who has the skill, knowledge, and ability to safely perform the work to which they are assigned.
Warning Signs

Warning signs are placed on the panel(s) to serve as reminders to anyone who is working on or near the panel that they must be careful and exercise proper care to avoid serious personal injuries, death or equipment damage. The warning signs that are commonly found on the control panels are described below. These signs should be inspected periodically by the Owner to make sure that all of the warning signs are in place and legible. If any of the warning signs are damaged or become illegible, please contact KSi Conveyors, Inc. for replacement signs.

Arc Flash Sign

This sign is designed to remind personnel working on or near this control panel of the electrical shock and arc flash explosion hazards. It also indicates key hazard avoidance techniques as well as ways to reduce the severity of potential injuries through the use of proper personal protection equipment.
Multiple Power Sources

This sign indicates that the panel may be powered from more than one source. All sources of power must be properly locked out and tagged out before the panel is fully de-energized.

UPS Voltage Sign

This sign indicates that there is an uninterruptible power supply in the panel (UPS) that will continue to provide a power source even if the primary power source to the panel is off. The UPS must be properly locked out and tagged out before the panel is fully de-energized.
Incoming Power Hazard

This sign informs the electrical worker that the incoming power to the panel remains energized even when the main disconnect is in the “ON or “OFF” position. It will remain energized until the panel power source is de-energized and properly locked out.

Panel Clearance Sign

This sign informs the owner that there is an OSHA and NEC requirement that space in front of the panel be kept clear for a minimum of 36 inches. The owner should consult these standards for additional information and guidance regarding this requirement.
Terms

Unless expressly stated elsewhere, the following terms shall have the meanings indicated below.

**Alternate Method**—A deviation from established procedures or policy that includes compensatory measures that assure equivalent objectives can be achieved by establishing and maintaining effective safety.

**Approved**—The result of a process implemented by qualified electrical workers or qualified supervisor that control measures effectively mitigate the electrical hazards associated with a task.

**Approved Equipment**—(1) listed equipment, or (2) unlisted equipment that is acceptable to the qualified workers who designed or will use the equipment and that is approved by Owner.

**Authorized Work**—Electrical work that a supervisor has permitted the qualified electrical worker(s) to perform based on an approved safe work procedure and appropriate work practices.

**Barrier**—A physical obstruction that is intended to prevent contact with exposed energized electrical conductors or circuit parts. Barriers can be temporary or permanent.

**Clarify**—To make codes, standards, and regulations understandable and free from confusion through an oral or written process.

**Compelling Reason**—The reason for authorizing workers to perform work on or near hazardous energized electrical circuit parts. The reasons include two types:

- increased or additional hazards of de-energizing critical systems; and
- unfeasible due to equipment design or operational limitations (e.g., testing of electric circuits that can only be performed with the circuit energized).

**Conductive**—Any material suitable for carrying electric current.

**Contract Personnel/Worker**—Individuals whose services are obtained from subcontractors and who are supervised by the Owner’s employees. Contract personnel are not employees of the Owner.

**Critical Systems**—Any system which would result in increased or additional hazards if de-energized, e.g., life support equipment, emergency alarm systems, hazardous location ventilation equipment, area lighting.

**De-Energized**—Free from any electrical connection to a source of potential difference and from electrical charge; not having a potential different from that of the earth. A state in which the conductor or circuit part to be worked on or near has been disconnected from energized parts, locked out and tagged out in accordance with established standards, tested/verified to ensure the absence of voltage, and grounded if determined necessary.

**Electrical Hazard**—A dangerous condition such that inadvertent or unintentional contact or equipment failure can result in shock, arc flash-burn, thermal burn, or blast.

**Electrical Safety**—Recognizing hazards associated with the use of electrical energy and
taking precautions so that hazards do not cause injury or death.

**Electrical One-Line Diagram**—A record of all power sources to electrical equipment.

**Electrical Work**—(1) working on or near energized electrical parts; (2) servicing or maintenance of potentially hazardous electrical equipment.

**Electrically Qualified Worker**—A worker who has successfully passed a formal electrical training program and has been determined by his/her supervisor to have the skill, knowledge, and abilities to safely perform the work to which he/she is assigned.

**Energized**—Electrically connected to a source of potential difference, or electrically charged to have a potential significantly different from that of earth in the vicinity. NOTE: “De-energized” parts that have not been verified and locked out and tagged out in accordance with established standards are considered energized.

**Flash Hazard**—A dangerous condition associated with the release of energy caused by an arc that suddenly and violently changes material(s) into a vapor.

**Hazardous Electrical Work**—All electrical operations in which workers may be exposed to an electrical hazard.

**Insulated**—Separated from other conducting surfaces by a dielectric (including airspace) offering a high resistance to the passage of current.

**Listed Equipment**—Equipment that meets nationally recognized standards. All listed equipment is approved for use consistent with the manufacturer’s instructions.

**Live Parts**—Electric conductors, busses, terminals, or components that are uninsulated or exposed and a shock hazard exists.

**Safety Watch**—A safety watch is a more stringent hazard control measure than the two-person rule and shall be implemented when there are grave consequences from a failure to follow safe-work procedures. The safety watch shall be a qualified electrical worker who must be responsible for monitoring qualified worker(s) performing high-hazard electrical work.

**Shock Hazard**—A dangerous condition associated with the release of energy caused by contact or approach to exposed electrical conductors or circuit parts nearer than the minimum air insulation distance.

**Standard Operating Procedure (SOP)**—A document which records the review of an operation to (1) identify the equipment, hazards, and operating limits that are present in the operation; (2) develop control measures that eliminate unacceptable risks; and (3) describe how an operation is to be safely performed.

**Subcontractors**—A party entering into a subcontract with the Owner.

**Two-Person Rule**—The requirement for two qualified electrical workers to be present in the workplace and to be aware of the other worker's task while performing electrically hazardous work.

**Working Near**—Any activity inside the limited approach boundary or the flash protection boundary (see NFPA 70E) of exposed energized electrical conductors or circuit parts that are not put into an electrically safe work condition.
SAFETY

**Working On**—Coming in contact with exposed energized electrical conductors or circuit parts with the hands, feet, or other body parts, with tools, probes, or with test equipment, regardless of the personal protective equipment a person is wearing.

**100% Rule**—Work on or near energized parts must be performed only after all participating qualified electrical workers are in 100% agreement on the work to be completed, on the sequence in which it should be performed, and that the hazards are fully controlled or mitigated.
Important Codes and Standards for Owners

There are many codes and standards that apply to the owner of this panel. These include both national and local standards and codes. It is the Owner’s responsibility to identify and follow all applicable codes and standards. Listed below are several of the key national standards. This list is not a complete list of all applicable standards.

OSHA 1910.147

Control of this equipment must be in accordance with OSHA Standard 1910.147 "The control of hazardous energy (lockout-tagout)". This standard "requires employers to establish a program and utilize procedures for affixing appropriate lockout devices or tagout devices to energy isolating devices and to otherwise disable machines or equipment to prevent unexpected energizing, start-up or release of stored energy in order to prevent injury to employees". For further information on Lockout-Tagout requirements, see your company’s Safety Director or refer to OSHA Standard 1910.147.

110.16 Flash Protection Field Marking

110.16 Flash Protection. Switchboards, panel boards, industrial control panels, and motor control centers in other than dwelling occupancies that are likely to require examination, adjustment, servicing or maintenance while energized, shall be field marked to warn qualified persons of potential electric arc flash hazards. The marking shall be located so as to be clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment.

FPN No. 1: NFPA 70E-2000, Electrical Safety Requirements for Employee Workplace, provides assistance in determining severity of potential exposure, planning safe work practices, and selecting personal protective equipment.

FPN No. 2: ANSI Z535.4-2002, Product Safety Signs and Labels, provides guidelines for the design of safety signs and labels for application to products.
**NFPA 79**

NFPA 79 provides guidance for industrial control panels. The following Emergency Stop definitions come from this standard.

**Emergency-Stop**

Actuators of emergency stop devices shall be colored RED. The background immediately around the device actuator shall be colored YELLOW. The actuator of a push-button-operated device shall be of the palm or mushroom-head type.

**Category-0 Stop**

Where a Category 0 stop is used for the emergency stop function, it shall have only hardwired electromechanical components. In addition, its operation shall not depend on electronic logic (hardware or software) or the transmission of commands over a communications network or link.

**Controlled Stop**

The stopping of machine motion by reducing the electrical command signal to 0 once the stop signal has been recognized by the control but retaining power to the machine actuators during the stopping process. (IEC 204-1 and NFPA 79).
Hazard Review and Safety Instructions

**ARC FLASH HAZARD**

**DANGER**

Serious injuries, burns or death could result from being in close proximity to or in the direct path of an arc flash explosion and the flying debris.

Arc flash accidents are most likely to occur during maintenance of the electrical system or when working on or near energized high voltage sources. This hazard does not exist when all electrical power sources have been disconnected, properly locked and tagged out. Serious injuries, burns or death could result from being in close proximity to or in the direct path of an arc flash explosion and the flying debris.

**ELECTROCUTION HAZARD**

**DANGER**

Severe burns or death may result from contact with exposed high voltage sources.

Electrocution accidents are most likely to occur during maintenance of the electrical system or when working on or near energized high voltage sources. This hazard does not exist when the electrical power has been disconnected, properly locked and tagged out.

**AUTOMATIC START HAZARD**

**WARNING**

Equipment controlled by this panel may start without warning, causing serious injury. STAY CLEAR.
Process equipment is usually controlled by an automated system and may start without warning. However, automatic startup by itself is not a hazard. Failure to properly disconnect, lockout and tagout all energy sources while inspecting, servicing or maintaining remotely controlled equipment creates a very hazardous situation. Serious personal injury may result. Always lockout and tagout all process equipment before while inspecting, servicing or maintaining remotely controlled equipment.
3 - Operator Controls

*General Description of the system Equipment and Operation.*

This control system is designed to automatically control the Bulk Seed Site, seed transfer equipment. Providing automatic batch control and information printout when a job is complete.

**General Control Panel Description**

The system consists of one control panels as follows:

- **Main Panel** - This panel houses the PLC, I/O, and Operator Interface devices. Motor starters, main disconnect, power distribution, and control power transformer are also located in this enclosure. In a few cases the motor control has been moved to its own panel for remote mounting. In this case a second enclosure is used, the same specifications as below will apply to the separate motor starter panel.
GENERAL PANEL SPECIFICATIONS

Some general specifications that apply to the above panel include:

1) NEMA 4 steel enclosure
2) Ground lug
3) Wire Color (From NFPA 79)
   a) GREEN (with or without one or more YELLOW stripes): shall be used to identify the equipment grounding conductor where insulated or covered.
   b) BLACK: Ungrounded line, load, and control conductors at line voltage.
   c) RED: Ungrounded ac control conductors, at less than line voltage.
   d) BLUE: Ungrounded dc control conductors.
   e) YELLOW: Ungrounded control circuit conductors that may remain energized when the main disconnecting means is in the OFF position. These conductors shall be YELLOW throughout the entire circuit, including wiring in the control panel and the external field wiring.
   f) WHITE or NATURAL GRAY: Grounded circuit conductor.
   g) BLUE WITH WHITE STRIPE: Grounded (current-carrying) dc circuit conductors.
   h) WHITE WITH YELLOW STRIPE: Grounded (current-carrying) ac control circuit conductors that remain energized when the disconnecting means is in the OFF position. For additional circuits powered from different sources that remain energized when the main disconnecting means is in the OFF position, striping colors other than GREEN, YELLOW or BLUE shall be used for the unique identification of the grounded conductors.
4) Terminal Colors -- Same as wire colors above.
5) Estop -- A Category 0 Estop is used.
Detailed Control Panel Descriptions

More detailed outlines of the various controls used on this job are as follows:

**MAIN PANEL**

This control panel houses the main controller, associated I/O, and motor control for this seed transfer system. The controller is an Automation Direct, Direct Logic 06 and may include expansion modules. Motor starters are located on this panel and power supply requirements will be noted and labeled above the main disconnect. It uses a NEMA 4 enclosure and external components. Operator interface for this system is exclusively through operators and a C-More 8” Touch Screen on the door of the enclosure. Interface functions are explained below.

**Push Buttons**

ESTOP - Category 0 controls the power to the PLC outputs including the motor starters. Control Power is maintained on the PLC CPU even when the ESTOP is engaged. Push the button to engage and pull the button to release. The button is not illuminated while depressed.
**Device Screen Control**

Each system device has a graphical representation that will indicate what should be happening with that actual device in the process. In this case the air gate KG101 is open and the under bin M100 is running as shown by the green graphics.

All devices are represented by a unique device ID that also doubles as a button to open the HOA control for that device. The device ID tag will be used for all associated information throughout the project.

In the example shown, KG102 HOA was accessed by touching the KG102 device ID tag on the Bin Screen. Once the KG102 HOA control is open the operator is able to force the gate “OPEN”, “CLOSE”, or into “AUTO”. “OPEN” and “CLOSE” over ride all other control except E-STOP and Pause. It must remain in “AUTO” for normal automatic operation.

We show here the HOA control for M100. Again this was opened by touching the device ID tag on the Bin Screen. In this case we can force the motor on by using “FWRD” or “RVRS” or off by using “OFF”. This also must be in “AUTO” for normal automatic operation. You will notice that there is also a “RESET” for the motor. Anytime that a device has proof logic and may fault this is where you must go to reset that individual device fault.

In the case of a device fault, the device will change on screen to indicate the fault. In the case of a motor fault you will see the circle at either end will be red and also wording that states that the motor has faulted. In the image to the left you can see that M100 has faulted. If the motor is running this circle will be green and if it is idle it will be black.
**Navigation Control**

We have provided two methods of screen navigation for your convenience. First, each main screen has been given a Navigation Bar on the top of the screen that allows you to move to any screen from any other screen.

**System Menu:**

**Data Menu:**

**Setup Menu:**

**Remote Menu:**

There is also a hot link button on the System Menu at the end of the flow on one screen that will take you to the next screen in the product flow. On each screen you will find a button where the product enters and exits the screen. Use either method as you prefer. In the image on the left you can see that there is a hot link button at the end of the under bin that will take you to the scale page.
Throughout the screen operation you will notice that some features are pass code protected. This was done to bring awareness to a potentially risky operator command. During startup these risks were explained and most of the time you will not need to be concerned. The default pass code in all cases is “777” unless we were asked to change it on startup. In the event that it was changed, record the new pass code here:______.
The Home Screen is a status overview of the entire in one screen. You can also enable and disable certain devices from this screen, giving you substantial control while setting up or running a job. You can customize which elements are displayed on the Home Screen by touching the bottom right corner of the home screen. Continue reading for details on the individual portions of the home screen.
MY SYSTEM CONTROL is your main point of control when running a job. Here you can start, pause or end jobs as well as increase or decrease the rate of seed treatment. When a job is running, the run status will display a live update of the current system activity. If you have questions on what the system or doing or why it is behaving a certain way this is the best to return to the homepage and check the Run Status to find out exactly what the system stage the system is in or what the system is waiting on.

In the example below, you can see that the Job is complete and that the system is waiting for the operator to print the ticket. Press MASTER PRINT in order to complete the order.
**System Menu**

There are 4 sub menus under the “SYSTEM MENU” button:

![System Menu: Bin Screen](image)

Here we show a bin that is set up properly. There are two things that you need to remember about the bin setup for it to function correctly. First, the “Bin Seed ID” must exactly match the requested “Seed ID” on the order screen for the current job. Second, the desired bin must be “ENABLED” as shown or the sequence will not be able to transfer seed automatically.
Sequence of Operations

**System Menu: Scale Screen**

The scale screen displays the scale hopper loader conveyor run status. The large display at the top of the scale is the actual scale weight and will match the display of the Cardinal scale indicator. The target weight for the current order is displayed below the actual readout. Finally, the status box will indicate what state the sequence is in for the current batch. Here the status of the scale is idle which means that the process is not running.

If scale screen display does not match the scale indicator there is a problem and the system will not function properly. Check that the Ethernet cable is securely connected between the scale indicator and the Control Panel. If the error persists, power off both the scale indicator and the Control Panel. If the error is not resolved, contact KSi for further support.

The status box displays the current scale status:

1. Idle – No job is running
2. Filling – Scale is Filling
3. Discharging – Scale is Discharging or ready to discharge. Prior to opening the scale gate, the system will verify that the treater drum and / or outbound conveyors are running. The scale gate will also close for a set amount of time if the high level sensor is activated. The high level timer can be adjusted in the AutoBatch Setup screen. These interlocks will vary depending on your specific site configuration.
System Menu: Treater Screen

The treater screen shows the status and gives control of the seed treater. Here you can see the four pump packs and the flow of chemicals from the pump to the atomizer. Each device on this page can be controlled in hand or in auto. The operator can calibrate the flow meters and name the pumps at this screen. See Chapter 5 for more details.
System Menu: Load Out Screen

The load out page is where you control your load out conveyors and will vary slightly depending on your site configuration. These conveyors can be set to start and stop automatically or set to be controlled manually. In this example the bypass diverter is set to go through the treater so the system verifies that the drum is running and the high level is not activated before releasing the seed through the treater.

This is the Discharge Conveyor Start/Stop controls that are found on the load out page. When the treater fill and treater discharge conveyors are in auto, pushing “START” on this button starts both of those conveyors when the interlocks are met and pushing “STOP” on this button stops both of these conveyors.

In this example, you can see that the Enable Auto Discharge has been enabled as this button is green. When this is enabled the treater fill and treater discharge conveyors will start and stop automatically. The Discharge Auto Off Delay value is a value entered by the operator and determines how long the discharge conveyors run after the scale is empty. This allows the system to discharge any remaining seed from the treater and load out conveyor after the scale has reached zero.
System Menu: Order Screen

The order screen is used for entering customer orders. You can either enter the order in manually for each order or you can pull in information from the Manage Customers database in the Data Menu or from the AutoDataV2 Database upgrade, which is a separate upgrade option.

To add client information previously been entered in the Manage Customers database, select the QUICK LOAD option. Quick Load pulls client information from the onboard database for the current order.

To add client information previously been entered in the AutoDataV2 Database, select the AUTO LOAD ORDER FROM DATABASE option at the top of the screen. This pulls client information from the remotely managed AutoDataV2 database for the current order. Contact KSi Sales or visit the automation section at http://www.ksiconveyors.com if you are interested in adding the computed controlled remotely managed KSi AutoDataV2 database upgrade to your system.
Setup Menu

There are 4 sub menus under the “SETUP MENU” button:

- **A) Logic Reset** – this resets the system to a default stage and should be used when advised by a KSi Automation Technician.
- **B) Enable Bin Fans** – This will be enabled by KSi Automation Technician if bin fans are a part of your automation package.
- **C) Enable Auto Discharge** – When this is enabled the discharge conveyors will turn on and off automatically
- **D) Enable Data Log to USB** – Enable this option needs to be enabled whenever you want to record your jobs to a USB drive.
- **E) Enable Network** – Enable this option to use an external database to record your database information.
- **F) Back** – Takes you back to the previous screen.
- **G) Set Date & Time** – Enter a value into each field and the press the Set Date & Time Button to set the date and time.
- **H) KSi Tech Setup** – This will only be used by a KSi Automation Tech.
- **I) Serial Number** – The serial number is specific to your automation system. Please have this number available when contacting KSi Automation for support or service.
- **J) Dealer** – Complete this information specific to your dealership. This information will print on every scale ticket.
**Setup Menu: AutoBatch Setup**

This screen is where you go to view and edit values that relate to the batching control of your automation.

A) **Seed Mode Select** – You can choose to run seed in one of the three modes by selecting one of the red buttons. The mode selected will be highlighted in green on the left and right side of the button, in this example AMOUNT = LBS/LBS is selected. Under each mode are parameters that tell the system how to calculate the Amount requested.

B) **Order “Complete” Tolerance** – This value tells the system that if the system gets within “X” lbs it will not run another batch to try and reach the exact ordered weight. This should not be confused with the accuracy of the system, which is +/- 5 lbs. This variable will only be necessary in rare situations.

C) **Scale Batch Capacity** – This should be set to match how many lbs your scale hopper can hold. This will communicate to the system when it needs to split an order into multiple batches.

D) **Scale Empty Tolerance** – When the scale gets within this value the system will view the scale as empty.

E) **Scale Empty Time** – This is the amount of time that you want the gate to stay open on the scale after the system registers the scale as empty.

F) **Cleanout Fill Conveyors for Time** – This is the amount of time that you need or want your conveyors to clean out after the bin gate has closed. If this value is too low then the conveyors will not completely clean out before the system grabs the scale weight and the ticket will print the incorrect weight.

G) **Fill Conveyors Off Delay Time** – This is the amount of time that the scale fill conveyors will run before turning off after the scale has reached its target weight.

H) **Slow Scale Time** – This is the amount of time that you are giving the scale to reach the target weight from the time you start the job before turning on the alarm light to alert the operator that something may be wrong.
I) **Motor Fault Time** – This is the amount of time for the motor starter to start before it will fault if it does not return an auxiliary proof. If this time is reached, then the motor will fault and you will need to reset the motor from the specific devices HOA control.

J) **Air Pressure Fault Time** – This is the amount of time that the system will tolerate a variation in air pressure before faulting the system which will force a system pause. This will happen if the Air Pressure falls below a preset value.

K) **Treater Inlet High Level Off Delay** – This is the amount of time that the treater fill conveyor and scale gate will remain off and closed before turning back on after the treater high level sensor has been uncovered by seed.

L) **Bin Fill System Setup** – These values will rarely be used and will be entered by a KSi Automation Tech if necessary.
1. AutoTreat Setup

This screen is where you go to view and edit values that relate to the treating control of your automation.

A) **Flow Rate Fault Setup** – This is a list of parameters that pertain to the faulting of your pumps.

A.1) **Wait for Time After Start** – This allows time at the beginning of the treatment cycle to get seed and liquid rates up to target and stabilize.

A.2) **% Over Limit** – This is the % over the target treatment is allowed to run before the pump will fault and pause the treatment system. This is not to be confused with the accuracy of the system as generally it will be within 1-2%. This setting is intended to fault and pause the treatment cycle when something is wrong that is causing misapplication of treatment.

A.3) **For Time** – The amount of time that the flow rate can stay over the % allotted in A.2 before the pump will fault and pause the system.

A.4) **% Under Limit** – This is the % under the target treatment is allowed to run before the pump will fault and pause the treatment system.

A.5) **For Time** – The amount of time that the flow rate can stay under the % allotted in A.4 before the pump will fault and pause the system.
B) **Flow Meter Setup** – These parameters are set for each flow meter and control how each flow meter operates.

B.1) **Raw Counts** – Raw data as received from the flow meter at the analog input. This is a view only field.

B.2) **Counts at Zero** – This value is the raw value the flow meter returns when the flow is zero. It is a numeric entry field and will be set by the KSi Automation tech. This value will only need adjustment if the flow meter was replaced by a different model/brand glow meter.

B.3) **Max EU (oz)** – This value is determined again by the exact flow meter used and will be initially set by the KSi Automation Tech. This value will only need adjustment if the flow meter was replaced by a different model/brand.

B.4) **Flow oz/min** – This is the initial calculated flow rate received from the flow meter before any filtering and is usually not smooth enough for control purposes.

B.5) **Avg TM.** – This is a sample averaging time applied to the B.4 value to smooth the flow value for process control.

B.6) **Control Flow** – After the average logic in B.5 is applied to the value in B.4 we get a value in B.6 that can be used for process control.

C) **Seed Wheel Setup** – These are parameters that are specific to the seed wheel and the calibration of the seed wheel.

C.1) **Volume of Seed Wheel** – Physical volume of the seed wheel. This value will only need adjustment if the seed wheel was replaced with a seed wheel of a different measurement volume.

C.2) **Final Adjust Factor** – This value is used for fine tuning the seed wheel. This can be done manually by calculating the difference between the scale weight for an order and the seed wheel totalized weight then making an adjustment to this final calibration factor. These numbers should match as closely as possible.

C.3) **Volume of Cal Container** – This is the actual volume of the container used to get the seed gram weight. The system uses this number to calculate actual seed wheel rate.

C.4) **Change Factor by %** – When Auto Adjust is enabled, see C.8, the system will adjust the Final Adjust Factor by this % of the amount calculated to compensate for the error. It is better to make smaller steps the right direction than make large corrections that may result in over correction.

C.5) **Gear Box Ratio** – This value is determined by the mechanical design of the seed wheel gear box and will only need adjusted if the seed wheel model is changed.

C.6) **Accel Time** – Sets the acceleration time of the seed wheel. This is usually not required.

C.7) **Decel Time** – Sets the deceleration time of the seed wheel. This is usually not required.

C.8) **Enable Auto Adjust Cal Factor** – If this button is enabled (button will be green) the system will automatically adjust the Final Adjust Factor in C.2 by the % of error entered in C.4. This will happen at the end of an order using the total scale throughput and the totalized seed wheel calculation.
D) **AutoTreat Drum Setup** – These are parameters specific to the drum on the treater
   
   **D.1)** **Drum Auto Speed** – This is the % of maximum speed that the drum will run by default in auto.
   
   **D.2)** **Prestart for Time** – This is how many seconds the drum will run before the system will release seed from the seed wheel into the drum.
   
   **D.3)** **End Run Fwrd for Time** – This is how many seconds the drum will run forward after the low level sensor does not see any more seed.
   
   **D.4)** **End Run Rvrs for Time** – At the end of the run, the drum will automatically reverse; this setting is for how many seconds the drum will run in reverse before it shuts down.
   
E) **Incr/Decr Seed Rate by Amount** – On the home page you have the ability to increase or decrease seed rate on the fly when running a job. This is where you set the value of how many lbs/min it changes when the increment or decrement button is pushed on the home screen.

F) **Stop Treat After Low Delay** – This is how many seconds the treatment will continue to be applied after the low level sensor does not see any more seed.

G) **IPAC Flow Meter Calibration Tube Reading Tolerance** – This tool is intended to prevent the operator from mistakenly entering an erroneous number when calibrating the flow meter. If a number is entered that is outside of this window then the flow meter calibration cycle will prevent it from being accepted. This does not mean the number is incorrect only that it is outside of this predetermined window. If you decide that the number is indeed correct simply increase the acceptable percentage window for that IPAC here.
   
   **G.1)** **IP910 % Under** – This defines the acceptable window bottom.
   
   **G.2)** **IP910 % Over** – This defines the acceptable window top.
SEQUENCE OF OPERATIONS

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4 – AutoBatch V3 Bin Setup

Description of Bulk Seed Transfer System Bin Setup
Sequence of Operations and Controls.

The recommended methods for setting bin parameters and control are defined as follows. This chapter will step you through required actions to complete a bin setup and calibration operation.
A: Go to the appropriate bin screen such as “BIN 1-4” and press “SETUP” for the bin that you wish to setup and calibrate. Each bin must be setup and calibrated before you run an order from that specific bin. The bin should be recalibrated when it is refilled with a variety of different size seed.

B: There is a security level designed into the system to help limit calibration changes to only operators who understand and operate the system on a regular basis. The default security code is “777”. Enter the code and press enter.
Overview of Bin Setup Parameters

A: Enter a unique seed identification for the seed in the selected bin using the seed variety only or in addition to other numbers and characters to make this unique for this bin. The system will use the Seed ID in order to prevent the operator from pulling seed from a different bin inadvertently.

B: Optional; enter the lot number for the seed in this bin if you desire to have this information included in the data for orders from this bin.

C: Enter seeds per lb as provided from the seed company’s delivery ticket. In the event that you choose to run orders using seed count units this number is required so the system can calculate the number of lbs required to fill an order of X Units.

D: Enter the amount of seed that has been put into the selected bin. Any time seed is added to the bin the operator is responsible for manually adjusting this number to represent the amount in the bin. As batches are automatically discharged from this bin by running orders the system automatically takes the batch amounts out of this number to keep a running total of how many pounds of seeds remain.
E: Enter the total amount of seed that your bin can physically hold. This establishes for the system a reference for displaying how full a bin is on the bar chart. This number will only change in the event that the bin size physically changes.

F: The seed wheel cal is required before you run the AutoTreat system so that the seed wheel can accurately calculate and control the rate of seed through the treatment system. Use the gram scale and calibration beaker provided with the seed treater. Put the beaker on the scale and Zero the scale (we only want the weight of the seed included in this number, not the container also) then fill level full with a sample of seed from the bin. If needed you can capture this sample after the “Run Auto Set” is complete as you will have seed available in the scale at that point. Just remember this number must be entered before you continue treating seed.

G: The Bin # Preact (lbs) value will be established by pressing “Run Auto Set”, refer to the following section. This value lets the system know how much seed to anticipate in the system between the bin discharge gate and the scale. The system then knows how much sooner the bin gate must be closed so that when the system is cleaned out you are at the requested target amount.

H: This value will be established by pressing “Run Auto Set”, refer to the following section. This value lets the system know the rate at which seed discharges from the bin. We always use weight based control when possible because it is more accurate and repeatable. However in the event that the amount requested is less than the preact amount running weight based control is not possible. The system will automatically detect this and run a “Fill by Time” cycle opening the gate for an amount of time determined by this rate value.

I: “Run Auto Set” can only be successfully run when the scale is empty and no other job is running. This will automatically establish calibration numbers for this specific bin and you will end up with 2500lbs of seed in the scale. Refer to the following section for more detail.

J: “Auto Adjust” can be enabled (this is enabled when the button is green) after the “Run Auto Set” is complete. This feature will compare the actual scale weight with the target scale weight at the end of each batch and make an adjustment to the preact by 75% of the difference. This helps automatically adjust for changes in small seed flow influences such as the bin getting emptier.
Accessing “Run Auto Set”

A: From the bin setup parameters window press “Run Auto Set”. This will automatically calibrate bin one. You must only start this if the scale is empty and you will end up with 2500 lbs in the scale. After “Run Auto Set” is complete, capture your seed sample for the seed wheel cal if needed then run an order to use the seed and run it out automatically. You will choose to run an order asking for 2500lbs to fill a box or run an order asking for more seed to fill a tender. If you ask for more than 2500lbs the system will add to the amount on the scale to meet the new target.

B: There is a security restriction designed into the system to help limit accidentally running this feature when it wasn’t intended. The default security code is “777”. Enter the code and press enter.
Overview of “Run Auto Set” Sequence

A: “Run Auto Set” will start by displaying the “Auto Set Monitor”. This window is communicating to the operator what the system is doing but does not require the operator to do anything. From this point the calibration will run automatically and finish with 2500lbs in the scale and the bin calibrated. The “Run Auto Set” sequence steps are listed below:

1. System runs the first shot using a 500lb target and a 0 preact. This means the scale fill conveyors will run and the bin gate will open and stay open until the scale sees 500lbs, the system will then shut the bin gate and start a 60 second cleanout time.

2. At the end of the cleanout time for the first shot the system will calculate initial run calibration values and set them in the display.

3. System then runs the second shot using a 2500lb target and initial run calibration values….testing them. At the end of the second run you should be fairly close to the target, if the system is off at all it will make a final adjustment to the initial calibration values and set them as the final cal numbers.

4. When “Auto Set” is complete press “Exit”.
5 – AutoTreat V3 IPAC Setup

Description of Bulk Seed Treatment System Pump Pac Setup

Sequence of Operations and Controls.

The recommended methods for setting pump pac calibration and control are defined as follows. This chapter will step you through required actions to complete a pump pac setup and calibration operation.

Setting Up Your Pump Pac

A: Make sure that this valve is set to direct treatment to the mix tank before any calibration or tuning is attempted. Also make sure that the following items have been completed:

1. Pump Pac has been plumbed per manufacturer’s instructions.
2. Choose the appropriate pump tube size based on pump type and flow requirements.
3. Load Treatment into your pump pac. If you are using water for testing purposes you must not use pure distilled water, as the flow meter will not work with a non conductive fluid.

4. Run the pump in “HAND” for a few minutes after loading Treatment to get all air out of the lines and filter.

Accessing IPAC Setup Parameters

A: Go to the “TREATER” screen and press “SETUP” for the IPAC that you wish to setup and calibrate. Each IPAC must be setup and calibrated before you run an order for that specific treatment.

B: There is a security level designed into the system to help limit calibration changes to only operators who understand and operate the system on a regular basis. The default security code is “777”. Enter the code and press enter.
Overview of IPAC Setup Parameters

A: Enter a treatment description into this field. This treatment description will be displayed above the pump pac and on the order screen. Entering a rate on the order screen will enable this pac to run when treating.

You are now ready to run a calibration cycle on your treatment pac…. Before starting the cal cycle check that the cal tube valve is closed and that you have jogged/drained treatment in the cal tube so that the liquid is at the “0” oz level.
B: Choose a pump speed that will give you between 50 and 100 oz in the cal tube in the given amount of time. You will get a feel for what this value needs to be to get your cal volume in the 50 to 100 oz range, beyond that it does not matter what this value is.

C: Choose a cal time that will give you between 50 and 100 oz in the cal tube at the given pump speed. You will get a feel for what this value needs to be to get your cal volume in the 50 to 100 oz range, beyond that it does not matter what this value is.

D: After the cal cycle has completed and has ran at the set pump speed for the set time, read the actual volume in the cal tube and enter the amount here.

E: This display value gives you a reference for the volume the flow meter calculated during the cal cycle using a cal factor of 1. Depending on the characteristics of the treatment this value will not always match the actual amount in the cal tube but many times will be close. It is OK if the actual cal tube volume does not match this number as long as it is the same amount off when the cal cycle is repeated.

F: When the cal cycle has ended and the cal tube volume has been entered in letter “D”, then press enter here to set the new cal factor.

G: This display shows the current cal factor adjustment that the system is applying to the flow meter reading to keep it accurate. Any time a cal cycle is started this value will be reset to 1. After the cal cycle is complete and the cal tube volume entered this calibration number will change to compensate for the difference between flow meter volume and actual cal tube volume. To check this value simply record it and run the cal cycle again. Both ending cal factors should be close to the same number plus or minus a few thousandths.

H: Use this button to begin the cal cycle after you have set the pump speed and cal cycle time.

When you have completed the cal cycle close this IPAC setup window, set the manual valve to drain back to the mix tank and set the pump pac valve to send treatment to the treater before you begin treating. You also may need to check the tuning on the IPAC control loop as covered in the following section.
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6 – Running Orders

Description of Using Shot Control on the Discharge Sequence of the Scale.

These are the recommended methods for running orders from various seed sources and discharging seed. This chapter will also step you through discharging all or a portion of an order using the shot controls.

Running an Order from a Bin

1. Make sure E-Stop is released (GENTLY twist knob ¼ turn clockwise if or pull knob gently out).
2. From the home screen, push the “AUTO” Button on the home screen to make every device Auto.
3. Make sure the scale cable and printer cable are plugged into the panel and the touch screen is reading the weight on the scale. Also, check the air pressure to make sure that there is 80-100 lbs of pressure reading on the KSi air manifold.
4. From the System Menu – Order page, enter seed amount (lbs/units/seed count) in the “Seed Amount” field on the Home Screen.
   See (A) on page 33 to learn how to change the seed amount between lbs, units, and count.
5. Enter the Seed ID into the “Job Seed ID” field. The Seed ID must exactly match the Bin ID that contains the desired seed.
6. From the System Menu – Scale Page, ensure that “Discharge Control” is enabled if desired. See “Discharging an Order in Shots” on page 52 for more information.
7. From the home screen, push “Start” to begin order fulfillment.
8. Select “Enable” on the correct Bin. Only the bin(s) with Seed IDs that match the current order will show the enable option.
9. Prepare the treater. The scale gate will not open until treater drum and discharge conveyors are running.
10. Turn on discharge conveyors by pushing “Discharge Start” on the Treater Screen (Discharge conveyors will automatically turn on if the Auto Discharge Function is engaged).
11. Turn on treater drum from the treater control panel.
12. Once the scale status reads “Discharging” the scale gate will open and begin to discharge. The scale fill conveyors will automatically turn off once the preset seconds are passed. See (F) on Page 33.
13. If the order is larger than the scale capacity, the system will run multiple batches. If there is another batch the scale fill conveyors will turn back on and the bin gate will open and start refilling the scale.
14. Once the job is complete and the treater is empty, push “Discharge Stop” on the Treater Screen. If the Auto Discharge Function is engaged these conveyors will turn off automatically after the preset seconds are passed that has been entered.
15. From the home screen, print the ticket from the Home Screen and if the ticket printed okay then push “Yes, finished printing”
16. If necessary, adjust preact in the Bin Setup Screen. If you got less than the requested Seed Amount, lower preact by the amount under received. If you got more than the requested Seed Amount, raise the preact by the overage amount.
Running an Order from a Box, Bag, or Wagon

1. If this is the first time running seed from a box, bag, or wagon, you need to configure a bin from the bin page to represent your seed source so that the system can run automated. From the System Menu: Bin 5-12 page, select Setup on one of the bin icons that you do not use. In the Bin Seed ID enter “BOX” to indicate that this bin is used to run an order from a box, bag, or wagon.

2. From the System Menu: Scale page, turn on the conveyors that need to be running to fill the scale. If you have a dedicated Re-Bag / Re-Box conveyor, you may have a Re-Bag or Re-Box button on your scale page. If so, select that button and use the Re-Bag Start button found there.

3. Fill the scale with the seed from the box, bag, or wagon.

4. Once all the seed is in the scale, turn the scale fill conveyors off.

5. From the System Menu: Order page, enter the weight amount currently in the scale minus 10 lbs into the “Seed Amount” field. For example, if you put 2,655 lbs of seed in the scale you will need to assign 2,645 lbs to the order.

6. Enter BOX in the “Seed ID” Field. This must match one of your bins as described in step 1. You can enter the seed identification information in one of the note fields from the Order page.

7. From the Home page, push “Start”. The fill conveyors will momentarily run and then turn off since the scale is filled to 10 lbs greater than the order amount.

8. Prepare the treater. The scale gate will not open until treater drum and discharge conveyors are running.

9. Turn on discharge conveyors by pushing “Discharge Start” on the Treater Screen. The discharge conveyors will automatically turn on if the Auto Discharge Function is engaged.

10. Turn on treater drum from the treater control panel.

11. Once the scale status reads “Discharging” the scale gate will open and begin to discharge. The scale fill conveyors will automatically turn off once the preset seconds are passed. See (F) on Page 33.

12. Once the job is complete and the treater is empty, push “Discharge Stop” on the Treater Screen. If the Auto Discharge Function is engaged these conveyors will turn off automatically after the preset seconds are passed that has been entered.

13. From the home screen, print the ticket from the Home Screen and if the ticket printed okay then push “Yes, finished printing”
Discharging an Order in Shots

1. Go to Scale Page and push “DISCHARGE CONTROL OFF”. The button will turn green and will say “DISCHARGE CONTROL ON” when this feature is enabled. You must enable this before you start your job or else you will not be able to discharge in shots.

2. Go to Home Screen and start your job as normal.

3. When the scale moves to the discharging sequence a window will pop up prompting you to select the scale discharge mode, All or Shot.

   If All is selected the scale will completely discharge as normal.

   If Shot is selected it will then prompt you to enter how many lbs you want to discharge (Desired Shot Size). Enter the desired amount (in lbs) that you want discharged from the scale.
4. The scale will discharge the specified quantity from the scale and then close the air gate. You will want to utilize the Dis Preact so that the amount discharged is accurate.

   a. Example: If you ask for a shot size of 2000 lbs and the scale discharges 2050 lbs your discharge preact will be 50 lbs as the scale gate needs to begin closing earlier, in this example the scale gate will begin to close when the scale reads 1950 lbs.

5. When the Shot is completely discharged and the scale gate is closed push the “PRINT SHOT” Button. This will print a ticket of the shot that you just ran.

6. You can now repeat steps 3-5 for any more shots that you want to run from the scale.

7. When you are on your last shot you will want to select All from the Scale Discharge Mode Select show on the right and the scale gate will remain open until the scale reaches zero. NEVER enter more for the desired shot size than the amount left in the scale. If this is done the scale will never reach its desired shot size and you will need to reset the job.
8. When the scale is empty you will finish the job as normal and then return to the home page to print the overall job ticket.
7 - Drawings

(Appended System Drawings Page numbers do not follow main manual.)